



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002NC1B

Title: Hydrological and Biogeochemical Investigations of Riparian Buffers in the Piedmont and Blue Ridge Regions of North Carolina

Project Type: Research

Focus Categories: Non Point Pollution, Water Quality, Solute Transport

Keywords: Riparian Buffer, Nutrients, Fecal Coliform Bacteria, Sediments, Water Quality, Surface-Groundwater Flowpaths

Start Date: 03/01/2002

End Date: 02/28/2003

Federal Funds Requested: \$17,313

Non-Federal Matching Funds Requested: \$34,625

Congressional District: 12

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Abstract

Non point source pollution has been identified as a major contributor to water quality degradation within most of the seventeen major river basins in North Carolina (EPA 1998). The most widespread causes of water quality impairment are attributed to suspended sediment, nutrient (N&P) and microbial contamination. The use of riparian (stream side) vegetated buffers has been identified as an effective Best Management Practice (BMP) in controlling nitrogen, suspended sediment and to some degree phosphorus inputs into surface waters (e.g. Daniels and Gillian 1996, Lowrance et al 1997). The use of such riparian buffers is now required in the Neuse and Tar-Pamlico River Basins located in the eastern Piedmont and Coastal Plain physiographic regions of the state (NCEI 2000). The majority of the hydrologic and biogeochemical investigations of riparian buffer functions have also been carried out in the eastern regions of the state. Vegetation, soils and subsurface geologic and hydrological conditions of the near stream zone differ markedly between the eastern to the western regions of the state (Trapp and Horn 1997). As subsurface conditions and vegetation vary, hydrological flow paths, nutrient uptake and biological attenuation and therefore riparian zone function is likely to change when compared to conditions in eastern North Carolina. Detailed hydrological and water quality field investigations are now required to determine effective buffer characteristics (width, composition, hydrologic setting) for riparian buffers to be located in the western and central regions of the state.

The majority of research examining the use of riparian streamside buffers as a BMP to reduce non point inputs to surface waters has primarily focused on their roles in nutrient uptake, sediment retention and to some degree trace metal and pesticide immobilization (eg. Peterjohn and Correll 1984, Comerford et al. 1992). Almost no comprehensive research has been published

The proposed research will assess the effectiveness of vegetated riparian buffers in controlling the export of nitrogen, phosphorus, suspended sediment and fecal coliform bacteria from agricultural operations to surface waters in the western Piedmont and Blue Ridge regions of the state. The project addresses topics 1, 4 and specifically 7 as identified by the NC WRI as research priorities for fiscal year 2003. The detailed examination of the chemical/hydrologic conditions operating in the near stream zone will provide a framework where the results from this study can be compared to those obtained for sites in eastern North Carolina and elsewhere to aid in the development of statewide riparian buffer criteria. A similar approach has been used successfully to classify buffer function in the various physiographic regions of the Chesapeake Bay Watershed (Lowrance et al. 1997). The efficiency of the vegetative buffers examined in this study is expected to be largely dependent upon the presence or absence of anoxic soils, rooting depth of riparian vegetation, volume of groundwater bypassing riparian soils, infiltration rates and sediment removal efficiency (Cirino and McDonnell 1997, Verchot et al. 1997). The examination of fecal coliform transport within riparian buffers will produce information regarding the utility of riparian buffers as a BMP to control NPS microbial contamination as well as a quantification of the loading rates of this contaminant from different land uses in the study area. The investigators view this as the initial stage of research for this project. Additional research is planned to extend the field monitoring database beyond this initial project phase. Future research efforts will involve the examination of riparian soil properties including denitrification potential, nutrient cycling and microbial attenuation within the riparian buffer as well as examining the application of hydrochemical transport models for simulating the flow of water through riparian buffers. Additional grant applications to extend and broaden the project are planned for other funding sources such as the USEPA and USDA.